

Oral Routes of Administration

- Oral refers to two methods of administration:
 - applying topically to the mouth
 - swallowing for absorption along the gastrointestinal (GI) tract into systemic circulation
- *po* (from the Latin *per os*) is the abbreviation used to indicate oral route of medication administration

Oral Dosage Forms

- Common dose forms for ***oral administration***
 - tablets
 - capsules
 - liquids
 - solutions
 - suspensions
 - syrups
 - elixirs

Oral Dose Forms

- ***Sublingual administration*** is where the dose form is placed under the tongue
 - rapidly absorbed by sublingual mucosa
- ***Buccal administration*** is where the dose form is placed between gums and inner lining of the cheek (buccal pouch)
 - absorbed by buccal mucosa
- Dose forms for sublingual and buccal administration:
 - tablets – lozenges – gum

Oral Dose Forms

- Capsules are preferred over tablets for patients with difficulty swallowing
- Water preferred over beverages to aid in swallowing
- Some dosage forms are designed to be sprinkled on food when swallowing a solid is difficult
- Liquid doses are swallowed more easily and are suitable for:
 - patients with swallowing difficulties
 - young children



Advantages of the Oral Route

- Ease and safety of administration
- Active ingredient is generally contained in powders or granules which dissolve in GI tract
- Sublingual (and buccal) administration has a rapid onset (less than 5 minutes) for lipophilic drugs, and the drug bypass the first pass metabolism

Disadvantages of the Oral Route

- Sublingual (and buccal) administration is not suitable for large doses of drugs
- Sublingual (and buccal) medications has a short duration of action
 - less than 30 to 60 minutes
 - not appropriate for routine delivery of medication
- Both sublingual and buccal drugs can be swallowed which decreases their bioavailability
- Buccal route may have
 - medicinal taste
 - local mouth irritation

Disadvantages of the Oral Route

- Delayed onset
 - dose form must disintegrate before absorption
- Destruction or dilution of drug by
 - GI fluids
 - food or drink in stomach or intestines
- Not indicated in patients who
 - have nausea or vomiting
 - are comatose, sedated, or otherwise unable to swallow
- Unpleasant taste of some liquid dose forms
 - must be masked by flavorings to promote compliance

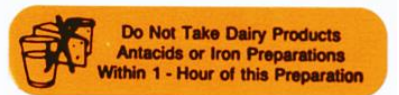
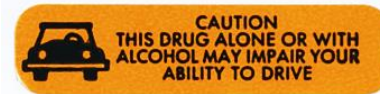
Dispensing Oral Medications

Patients should be told:

- Not to crush tablets or open capsules intended to be swallowed whole
 - e.g., sustained-release, long-acting, and enteric-coated drugs
- What foods to take (and not take) the medication with.

Dispensing Oral Medications

The dispensed drug package may include colorful “auxiliary” labels to remind the patient what to do (or not do) while taking a medication



Dispensing Oral Medications

- Patients need instruction on proper storage of nitroglycerin
- Sublingual nitroglycerin tablets should be stored in their original container (brown glass bottle)
 - lid screwed on tightly to prevent sunlight and air from causing potency loss
 - pillboxes are not recommended
 - refill nitroglycerin with a fresh bottle every 6 months

Administering Oral Medications

- Buccally administered nicotine gum
 - proper administration allows the gum to release nicotine slowly and decrease cravings
- Proper administration technique:
 1. Chew the gum slowly and stop chewing when you notice a tingling sensation in the mouth.
 2. “Park” the gum between the cheek and gum, and leave it there until the taste or tingling sensation is almost gone.
 3. Resume slowly chewing a few more times until the taste or sensation returns.
 4. Park the gum again in a different place in the mouth.
 5. Continue this chewing and parking process until the taste or tingle no longer returns when the gum is chewed (usually 30 minutes).

Administering Oral Medications

- Proper administration technique for buccally administered lozenges:
 1. Allow lozenge to dissolve slowly over a 30-minute period without chewing or swallowing.
 2. A tingling sensation (from the release of nicotine) is expected.

Administering Oral Medications



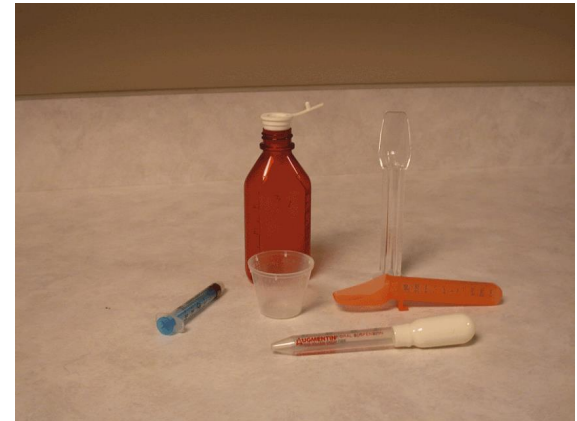
If nicotine gum is chewed vigorously, then too much nicotine will be released, causing unpleasant side effects.



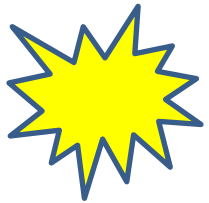
Remind the patient not to eat or drink for 15 minutes before or while using gum or lozenge dosage forms

Administering Oral Medications

- Patients with difficulty in swallowing solids should place the dose on the back of the tongue and tilt the head forward
- Liquid medication doses must be accurately measured
 - in a medication cup
 - medication measuring spoon
- Common household utensils are not accurate
 - an oral syringe or measuring dropper may be used for infants or young children



Dispensing Oral Medications



Always check the manufacturer recommendations for storage and expiry date on reconstituted products.



When suspensions are dispensed, remind patients to store properly and shake the bottle before dosing.

Topical Routes of Administration

- ***Topical administration*** is the application of a drug directly to the surface of the skin
- Includes administration of drugs to any mucous membrane
 - Skin
 - nose
 - Ears
 - Colon
 - Eye
 - Urethra
 - Vagina
 - Lungs

Topical Dosage Forms

Dosage forms for topical administration include:

- Skin:
 - creams
 - ointments
 - lotions
 - gels
 - transdermal patches
 - disks
- Eye or ear:
 - solutions
 - suspensions
 - ointments
- Nose and lungs:
 - sprays and powders
- Local therapeutic effects
- Not well absorbed into the deeper layers of the skin or mucous membrane
 - lower risk of side effects
- Transdermal route offers steady level of drug in the system

Topical Dosage Forms

Dosage forms for topical administration include:

- Vagina:
 - tablets
 - creams
 - ointments
- Urethra:
 - inserts
 - suppositories
- Rectum:
 - creams
 - ointments
 - solutions
 - foams

Topical Dosage Forms

► Transdermal administration:

- delivers drug to bloodstream via absorption through the skin via a patch or disk

► Skin presents a barrier to ready absorption

- absorption occurs slowly

- therapeutic effects last for 24 hours up to 1 week

► Chemicals in the patch or disc force drug

- across membranes of the skin

- into layer where absorption into bloodstream occurs



Topical Dosage Forms

- **Ocular administration** is the application of a drug to the **eye**
- **Conjunctival administration** is the application of a drug to the **conjunctival mucosa** or **lining** of the inside of the **eyelid**
- **Nasal administration** is the application of a drug into the passages of the **nose**. Sprays for inhalation through the nose may be for local or systemic effects
- **Otic administration** is the application of a drug to the **ear canal**.

Topical Dose Forms

Rectal dosage forms:

➤ Suppository

- solid dose form formulated to melt in the rectum at body temperature and release the active drug

➤ Creams, ointments, and foams

- used for local effects

➤ Rectal solutions, or enemas used for

- cleansing the bowel
- laxative or cathartic action
- drug administration in colon disease

Topical Dose Forms

Rectal administration is a preferred method when:

- An oral drug might be destroyed or diluted by acidic fluids in the stomach
- An oral drug might be too readily metabolized by the liver and eliminated from the body
- The patient is unconscious and needs medication
- Nausea and vomiting or severe acute illness in the GI tract make patient unable to take oral drugs.

Rectal administration disadvantages:

- inconvenience
- erratic and irregular drug absorption

Topical Dosage Forms

- The ***intrarespiratory route*** of administration is the application of drug through inhalation into the lungs, typically through the mouth
 - lungs are designed for exchange of gases from tissues into bloodstream
 - usual dosage form is an aerosol
 - “environmental friendly” propellants now required to replace chlorofluorocarbons (CFCs)
- A ***metered-dose inhaler (MDI)*** is a common device used to administer a drug in the form of compressed gas through inhalation into the lungs
- A diskus is a newer dosage form to administer drug to lungs as micronized powder

Topical administration of drugs

- The ***vaginal route*** of administration is application of drug via cream or insertion of tablet into the vagina
- Common dosage forms include:
 - emulsion foams
 - inserts
 - ointments
 - solutions
 - sponges
 - suppositories
 - tablets
- The vaginal route is preferred for:
 - cleansing
 - contraception
 - treatment of infections
- Major disadvantages:
 - inconvenience
 - “messiness”

Topical administration of drugs

- The ***urethral route*** of administration is application of drug by insertion into the urethra
- Common dose forms include:
 - solutions
 - suppositories
- Urethral delivery may be used to treat
 - incontinence
 - impotence in men
- Disadvantages
 - inconvenience
 - localized pain

Dispensing and Administering Topical Medications

- It is important for the patient to understand appropriate use and administration of topical drugs at the time of dispensing
- Improper technique or overuse of topical drugs can
 - increase the risk of side effects
 - alter drug efficacy

Ointments, Creams, Lotions, and Gels

- Dosage forms should be applied as directed
 - generally applied to the skin
 - lotions, creams, and gels are worked into the skin
- When using nitroglycerin ointment the patient or caregiver should wear gloves
 - to avoid absorbing excessive amounts of drug, which could cause a headache

Ointments, Creams, Lotions, and Gels

When using topical corticosteroids:

- Apply sparingly to affected areas for short periods of time
- Affected area should not be covered up with a bandage unless directed by the physician
 - occlusive dressings can significantly increase drug absorption and risk of side effects
- Overuse of potent topical corticosteroids can lead to serious systemic side effects

Transdermal Patches

- Site of administration must be rotated and relatively hair free
- Should not be placed over a large area of scar tissue
- Some are replaced every day, others maintain their effect for 3 to 7 days
- Some patients should remove nitroglycerin patch at bedtime to prevent development of ***drug tolerance*** where the body requires higher doses of drug to produce the same therapeutic effect.
- Some testosterone patches are applied to the skin of the scrotum
- Transdermal patches should be carefully discarded after use because they could cause serious side effects if ingested by young children or pets.

Ophthalmic Medications

- Must be at room temperature or body temperature before application
- Should be stored according to package information
 - reduces bacterial growth
 - ensures stability
- Considered sterile products
 - only preparations with preservatives can be repeatedly used

Ophthalmic Medications

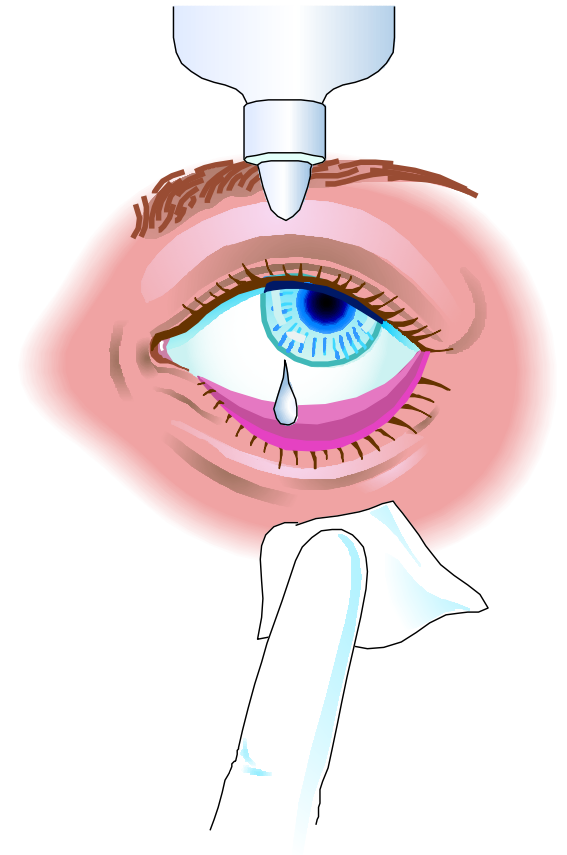
- Before application, patient should wash hands
 - prevents contamination of application site
- Tube or dropper should not touch the application site
 - medication may become contaminated
- Only sterile ophthalmic solutions or suspensions should be used in the eye
 - not preparations intended for other uses (e.g., otic)
- Some products are unit of use
 - to be used for one administration only and then discarded

Ophthalmic Medications

- Previously applied medications should be cleaned away
 - also any drainage from the eye
- Intended location is the conjunctiva
- Poorly administered eye drops could result in loss of medication through the tear duct
- Poorly placed ointments may be distributed over the eyelids and lashes

Ophthalmic Medications

- Patient's head should be tilted back.
- After administration, the patient should place a finger in the corner of the eye, next to the nose to close the lacrimal gently
 - prevents loss of medication through tear duct
- Patient should also keep the eyes closed for 1 or 2 minutes after application.

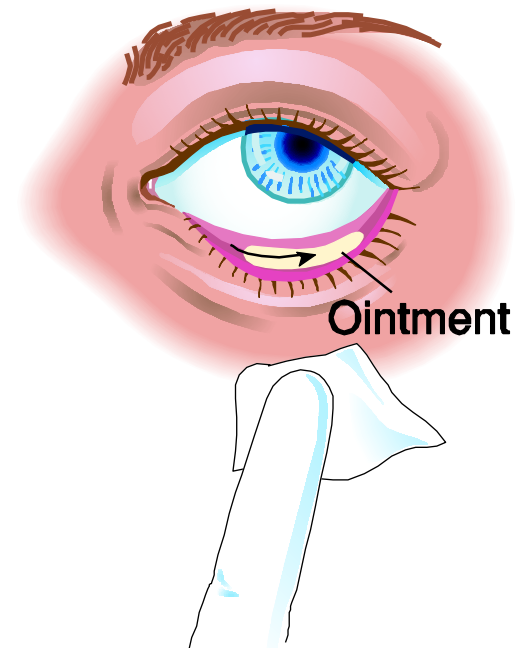


Ophthalmic Medications

- When multiple drops of more than one medication are to be administered, the patient should wait 5 minutes between different medications
 - the first drop may be washed away
- If an ointment and a drop are used together, the drop is used first
 - wait 10 minutes before applying the ointment

Ophthalmic Medications

- Ointments are generally applied at night
 - drug form of choice when extended contact with the medication is desired
 - remind patient that some temporary blurring of vision may occur after application



Ophthalmic Medications

- Unused medication should be discarded 30 days after the container is opened.
- Manufacturer expirations do not apply once a patient has opened the medication.
- Ear drops can never be used in the eye, but eye drops can be used in the ear.

Otic Medications

- Must be at room temperature or body temperature
 - heated drops may cause rupturing of the eardrum
 - cold drops can cause vertigo and discomfort
- Old medication should be removed along with any drainage before applying fresh medication
- Alcohol causes pain and burning sensation
 - should not be used if the patient has a ruptured tympanic membrane (eardrum)

Otic Medications

- Tilt head to side with ear facing up
 - 2 to 5 minutes
- Cotton swabs placed in the ear after administration of drops will prevent excess medication from dripping out of the ear
 - swabs will not reduce drug absorption



Patients under 3 should have lobes pulled down and back.



Patients over 3 should have lobes pulled up and back

Nasal Medications

- **Applied by:**
 - drops (instillation)
 - sprays
 - aerosol (spray under pressure)
- **Used for:**
 - relief of nasal congestion or allergy symptoms
 - administration of flu vaccine

Nasal Medications

- Patient should:
 - tilt head back
 - insert dropper or spray or aerosol tip into the nostril pointed toward the eyes
 - apply prescribed number of drops or sprays in each nostril
- Breathing should be through mouth to avoid sniffing medication into the sinuses
- Important not to overuse nasal decongestants
 - follow label instructions carefully

Inhaled Medications



- Metered-dose inhalers (MDI) provide medication with compressed gas
 - deliver specific measured dose with each activation
- Some devices use a powder or non-aerosolized spray for inhalation instead of compressed gas
- Nebulizers create a mist when a stream of air flows over a liquid
 - commonly utilized for young children or elderly patients with asthma or lung disease

Inhaled Medications

- Proper administration of aerosolized medications:
 1. Shake canister well
 2. “Prime” by pressing down and activating a practice dose.
 3. Insert canister into a mouthpiece or spacer to reduce the amount of drug deposited on the back of the throat.
 4. Breathe out and hold spacer between lips making a seal.
 5. Activate MDI and take a deep slow inhalation.
 6. Hold breath briefly and slowly exhale through the nose.
- If an MDI contains a steroid, the patient should rinse the mouth thoroughly after dose to prevent oral fungal infection.

Vaginal Medications

- Indicated for
 - bacterial or fungal infection
 - hormone replacement therapy
- The patient is instructed to use the medication for the prescribed period to ensure effective treatment

Rectal Medications

- Suppository
 - remove suppository from its package
 - insert small tapered end first with index finger for the full length of the finger
 - may need to be lubricated with a water-soluble gel to ease insertion
- Enemas
 - rectal injection of a solution
- Refrigeration may make insertion of rectal medications easier in warm climates.

ROUTE OF ADMINISTRATION	ABSORPTION PATTERN	ADVANTAGES	DISADVANTAGES
Oral	● Variable; affected by many factors	● Safest and most common, convenient, and economical route of administration	● Limited absorption of some drugs ● Food may affect absorption ● Patient compliance is necessary ● Drugs may be metabolized before systemic absorption
Intravenous	● Absorption not required	● Can have immediate effects ● Ideal if dosed in large volumes ● Suitable for irritating substances and complex mixtures ● Valuable in emergency situations ● Dosage titration permissible ● Ideal for high molecular weight proteins and peptide drugs	● Unsuitable for oily substances ● Bolus injection may result in adverse effects ● Most substances must be slowly injected ● Strict aseptic techniques needed
Subcutaneous	● Depends on drug diluents: Aqueous solution: prompt Depot preparations: slow and sustained	● Suitable for slow-release drugs ● Ideal for some poorly soluble suspensions	● Pain or necrosis if drug is irritating ● Unsuitable for drugs administered in large volumes
Intramuscular	● Depends on drug diluents: Aqueous solution: prompt Depot preparations: slow and sustained	● Suitable if drug volume is moderate ● Suitable for oily vehicles and certain irritating substances ● Preferable to intravenous if patient must self-administer	● Affects certain lab tests (creatinine kinase) ● Can be painful ● Can cause intramuscular hemorrhage (precluded during anticoagulation therapy)

ROUTE OF ADMINISTRATION	ABSORPTION PATTERN	ADVANTAGES	DISADVANTAGES
Transdermal (patch)	● Slow and sustained	● Bypasses the first-pass effect ● Convenient and painless ● Ideal for drugs that are lipophilic and have poor oral bioavailability ● Ideal for drugs that are quickly eliminated from the body	● Some patients are allergic to patches, which can cause irritation ● Drug must be highly lipophilic ● May cause delayed delivery of drug to pharmacological site of action ● Limited to drugs that can be taken in small daily doses
Rectal	● Erratic and variable	● Partially bypasses first-pass effect ● Bypasses destruction by stomach acid ● Ideal if drug causes vomiting ● Ideal in patients who are vomiting, or comatose	● Drugs may irritate the rectal mucosa ● Not a well-accepted route
Inhalation	● Systemic absorption may occur; this is not always desirable	● Absorption is rapid; can have immediate effects ● Ideal for gases ● Effective for patients with respiratory problems ● Dose can be titrated ● Localized effect to target lungs: lower doses used compared to that with oral or parenteral administration ● Fewer systemic side effects	● Most addictive route (drug can enter the brain quickly) ● Patient may have difficulty regulating dose ● Some patients may have difficulty using inhalers
Sublingual	● Depends on the drug: Few drugs (for example, <i>nitroglycerin</i>) have rapid, direct systemic absorption Most drugs erratically or incompletely absorbed	● Bypasses first-pass effect ● Bypasses destruction by stomach acid ● Drug stability maintained because the pH of saliva relatively neutral ● May cause immediate pharmacological effects	● Limited to certain types of drugs ● Limited to drugs that can be taken in small doses ● May lose part of the drug dose if swallowed